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Kathy Ning Shen
Faculty of Business, kathys@uow.edu.au

Mohamed Khalifa
College of Business Studies, mkhalifa@uow.edu.au

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Kathy Ning Shen, Faculty of Business, University of Wollongong in Dubai, Dubai, United Arab Emirates, kathyshen@uowdubai.ac.ae

Mohamed Khalifa, College of Business Studies, Al Ghurair University, Dubai, United Arab Emirates, khalifa@agu.ac.ae

Abstract

Gender composition of VCs shapes the members' communication style and content, and has a potential in influencing the anticipated benefits from VC participation. Extending prior research on VC participation and group composition, this study examines the moderating effect of gender composition in influencing the linkage between two important identity-based determinants, i.e., identification and identity confirmation, and VC participation. The research model was validated with an online survey involving 3 male dominant VCs and 1 female dominant VC. The results show that identification is a significant and stable determinant for members' VC participation regardless of gender composition, but the effect of identity confirmation on VC participation is only significant for those in a female dominant VC. The theoretical and practical implications of the research are discussed.

Keywords: virtual community participation, social identity, self-verification, gender composition.

1 INTRODUCTION

Virtual communities (VCs), sometimes called online communities, describe the mediated social spaces in the digital environment that allow groups to form and be sustained primarily through on-going virtual communication processes (Bagozzi & Dholakia, 2002). Much evidence has shown their potent influence in bringing together far-flung, like-minded individuals (Hagel & Armstrong, 1997) and their commercial and/or social values (Pai & Tsai, 2011). In spite of reduced non-verbal cues in computer-mediated communication, discussions in VCs are still rich in gender-based language cues (Herring, 1993). Existing research argues that males and females differ in linguistic features and communication styles (Gefen & Ridings, 2005; Kapidzic & Herring, 2011), which affect what they can benefit from VC participation (Barker, 2009). However, the findings about gender differences in communication styles and/or content are equivocal with some studies failing to report significant gender differences (Mo, Malik, & Coulson, 2009).

Recent development suggests that such differences in communication behaviour of males and females depend on the gender composition of the group of which they are members (Savicki & Kelley, 2000). According to Herring (1993), group composition shapes the "gender" of online discussion. The group dominant with male tends to follow "Anarchic/Agonistic" norms, emphasizing freedom from censorship and promoting candour and debate. On the contrary, female dominant groups are more inclined to "Positive Politeness" and encourage support, helping and consideration. Some anecdote evidence indicates that members tend to adopt group norms developed by the majority in communication (Seale, 2006). But most prior research about the impact of gender composition is conducted in small task groups (Savicki, Kelley, & Ammon, 2002) and there is the lack of research on gender composition in the context of VCs. Thus, this research attempts to investigate how the gender composition of a VC affects members' VC participation.

Prior research on VC participation has suggested two important identity-based determinants for VC participation, i.e., identification and self-verification. Social identity describes the need for a sense of belonging, and emphasizes the collective influences (Postmes, Spears, & Lea, 1998) in motivating VC participation. In contrast, self-verification focuses on the need for being unique by making personal identity salient and recognized (Ma & Agarwal, 2007). Gender composition of VCs shapes the members' communication style and content, and has a potential in influencing the anticipated benefits from VC participation. Thus, from identity perspectives, this research aims to examine how gender composition of VCs affects the dual identity processes in driving VC participation.

This paper is organized as follows. First we develop the research model to explain the relationship between identity-based needs and VC participation and the moderating effect of gender composition. This is followed by a discussion of research methods and findings. Finally, we conclude the article with theoretical and practical implications as well as the future research directions.

2 THEORETICAL DEVELOPMENT

Social identity was first proposed by Tajfel (1972) and refers to "the individual's knowledge that he belongs to certain social groups together with some emotional and value significance to him of this group membership" (p292). Self-categorization theory is proposed by Turner (1985) and his colleagues (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987) as an extension of social identity theory. In this theory they specify in detail how social categorization produces prototype-based depersonalization of self and others, and thus generates social identity phenomena. Self-categorization or social categorization of self is a cognitive process whereby self is assimilated to the in-group prototype and depersonalizes self-conception, i.e., self is no longer represented as 'unique individual' but as embodiments of the relevant prototype. Once identified with a social category, the individual tends to define him- or herself in terms of the defining features of the social category which renders the self stereotypically "interchangeable" with other group members, and stereotypically distinct from

outsiders (Hogg & Abrams, 1988). Accordingly, Ashforth and Mael (1989) define identification as the "perception of oneness with or belongingness" to the social category. Once identified with an organizations or a group, either physical or virtual, the individual will exhibit a more autonomous motivation resulting not only in a higher quality of engagement (e.g., greater persistence, effort, etc.) but also in more positive experiences such as enjoyment, sense of purpose, and well-being (Ryan & Deci, 2001).

Similar to organizational identification, this study defines VC identification as one's conception of self in terms of the defining features of the VC that renders the self-depersonalized (cf. (Bagozzi & Dholakia, 2002). Since VCs are usually sustained by voluntarily user-generated content, identification has also been used to explain VC participation (Kankanhalli, Tan, & Wei, 2005). Numerous empirical evidence has shown that identification with an organizations or a group, either physical or virtual, enhances cooperative behaviour (Dukerich, Golden, & Shortell, 2002), participation (Dholakia, Bagozzi, & Pearo, 2004), and knowledge contribution (Kankanhalli, et al., 2005). Thus, we also hypothesize that:

> *H1: the member with strong identification with a VC will be more likely to participate in VC discussion.*

According to self-verification theory (Swann Jr., 1983), stable self-views provide people with a crucial source of coherence, an invaluable means of defining their existence, and guiding social interaction (cf. (Swann, Rentfrow, & Guinn, 2003). Hence, people are motivated to validate and confirm their self-concepts, even when those self-concepts are negative (McNulty & Swann Jr., 1994). Identity confirmation, then, refers to a state that exists when an individual's social environment is consistent with his or her "self-identities" and is conceptualized in terms of congruence between how a group member defines him- or herself and how other group members define that person (Milton & Westphal, 2005).

In VCs, Hars and Ou (2002) identified peer recognition for the focal person as a form of extrinsic reward for participating in VCs dedicated to open source programming. Chan et al. (2004) further identified different forms of recognition, i.e., identity, expertise and tangible recognition, and demonstrated the positive linkages between recognition and VC participation. Ma and Agarwal (2007), relying on self-verification theory, proposes that consonance between the focal person's self-concept and the others' perception of the focal person would enhance the focal person's knowledge contribution to and satisfaction with the VC. Thus, we also hypothesize that:

> *H2: the member with high identity confirmation will be more likely to participate in VC discussions.*

According to Herring (1993), group composition shapes the "gender" of online discussion. The group dominant with male tends to follow "Anarchic/Agonistic" norms, emphasizing freedom from censorship and promoting candour and debate. On the contrary, female dominant groups are more inclined to "Positive Politeness" and encourage support, helping and consideration. Supporting this proposition, Savicki and colleagues (Savicki, Kelley, & Lingenfelter, 1996) reported that female only groups used more self-disclosure, statements of personal opinion, "I" statements and coalition language than did the male only or mixed groups.

Similarly, Seale et al. (2006), by analysing the messages posted to breast and prostate cancer forum, found that members in the breast cancer group were more likely to use emotional words and to discuss feelings or issues related to their lifestyles; while members in the prostate cancer forum tended to use words associated with medical aspects of the disease and discuss findings of related research. Moreover, males in the breast cancer forum appeared to adopt a style of communication that was more characteristic of women than men, i.e., emotion-focused. However, such a tendency is less significant for females in the prostate cancer forum (Seale, 2006). Such gender differences in communication style and content are usually insignificant in mixed gender support groups (Mo, et al., 2009). This

suggests that gender norms are more likely prominent and accessible in groups dominant with male or females and members tend to adopt group norms developed by the majority in communication.

Gender composition of VCs, by shaping members' communication styles and linguistic features, renders different social contexts for members to fulfil their identity-based needs. In female-dominant VCs, members tend to give and receive more positive comments (Thelwall, Wilkinson, & Uppal, 2010), and engage more in self-disclosure (Sheldon, 2013), resulting in a social context encouraging revealing self-identity and supporting members' need for identity confirmation. In contrast, members in male-dominant VCs are likely engaged in discussion or debate about certain issues that instil the meaning of "who we are" or the development of collective identity. While members involve less in self-disclosure or emotional social exchange about personal issues, the collective identity is more likely salient and accessible for members to identify with. Thus, we hypothesize that:

> *H3: the gender composition affects the relative importance of identification and identity confirmation in determining VC participation in that for members in female-dominant VCs, VC participation is more driven by identity confirmation than identification; while for members in male-dominant VCs, VC participation is more driven by identification than identity confirmation.*

3 RESEARCH METHOD

The research model was validated with an online survey study involving 4 VCs in English with different gender compositions. An invitation was sent to the administrators who helped distribute the survey in the major discussion boards of each VC. In addition, user IDs were required and validated so that only registered members in designated VCs were allowed to participate in the survey. There were 325 respondents in total from three male dominant VCs and one female dominant VC (See Table 1). Table 2 reports the demographic information of the whole sample and the mean values for each VC. As indicated in Table 1, all VCs were communities of interest with similar size in terms of active members. VC1, 2 and 3 were male dominant communities while VC4 was female dominant.

Name of VC	No. of Respondents	Size: Active Members	Topic
VC1(Male Dominant)	85	24800	IT
VC2(Male Dominant)	37	32542	Football Community
VC3(Male Dominant)	71	83022	PC Hardware
VC4(Female Dominant)	162	71900	Do It Yourself

Table 1. Profile of VCs

	Items	Frequency (%)			
		VC1	VC2	VC3	VC4
Gender	Female	20	13.5	2.8	**99.4**
	Male	**80**	**86.5**	**97.2**	0.6
Age	<20	22.4	13.5	19.7	16.7
	20~30	48.2	35.1	53.5	62.3
	>30	29.4	51.4	26.8	21
Frequency of the visit	More than once a day	57.6	37.8	59.2	66.7
	Once a day	31.8	29.7	29.6	21
	At least once a week	10.6	21.6	8.5	8
	At least once a month	0	10.8	2.8	4.3
Status in the VC	Member	95.3	89.2	94.4	96.9
	Moderator	4.7	8.1	2.8	2.5
	Administrator	0	2.7	2.8	0.6

Number of other VCs with similar themes (Parallel VCs)	Never	17.6	5.4	7	19.1
	1	20	24.3	18.3	38.9
	2	22.4	35.1	28.2	21.6
	3	20	16.2	22.5	10.5
	More than 3	20	18.9	23.9	9.9

Table 2. Demographic Information

3.1 Measurement

The participation level distinguishes members from leaders, participant to lurkers (Blanchard, 2004). Blanchard also distinguishes two types of leaders, i.e., information leader (major provider of expertise and knowledge about a topic) and social leader (major provider of social support among members). According to this typology, two items were developed to measure the extent of each type of participation, i.e., information contribution and social support (1=Does not describe me at all; 7=Describes me very well). Extant research has shown that self-reporting estimates are relatively accurate in that they are quite similar in magnitude to log data values (Deane, Podd, & Henderson, 1998).

Identification was measured with the most widely used scale developed by Mael and Ashforth (1992). The scale consists of six reflective items rated on a 7-point Likert scale, ranging from "strongly disagree" to "strongly agree". A sample item is "when someone criticizes this forum, it feels like a personal insult". As for identity confirmation, the same approach was adopted as was used by Ma and Agarwal (2007).

Two controls were included in the survey. The first one is community tenure, as Mael and Ashforth (1992) indicate that the length of time a person is actively involved with an organization is positively related to identification. The second control is offline activities. The examined VCs were launched as purely online forums, with time members also getting involved in some offline activities, which may have affected identification and identity confirmation. Items adapted from (Koh & Kim, 2003) and (Ma & Agarwal, 2007) were used to measure offline activities.

3.2 Data Analysis

Since the data was collected from several VCs, it was necessary to ensure the homogeneity in measurement and structural model before pooling together the data from different sites. Therefore, a series of group invariance tests were conducted with AMOS 5.0. The tests followed the procedure derived from the seminal work of Joreskog (1971). The tests of group invariance typically begin with scrutiny of the measurement model followed by the examination of the structural variance. In particular, the pattern of factor loadings for each observed measures was tested for its equivalence across different VCs. Once it is known which measures are group-invariant, these parameters are constrained equal while subsequent tests of the structural parameters are conducted. Thus the process of determining non-equivalence of measurement and structural parameters across groups involves the testing of a series of increasingly restrictive hypotheses, following an orderly sequence of analytic steps. Those groups with invariant measurement loadings and structural variance were pooled together for the model testing.

The model testing for each distinct group was done in a holistic manner using Partial Least Squares (PLS). Another advantage of using PLS is that resampling technique establishes confidence intervals based not on assumptions, such as multivariate normal distributions but on repeated samples from the researcher's own data. Thus, the normality of the survey data will not influence the PLS results. Tests of significance were conducted for all paths using the bootstrap re-sampling procedure and the standard approach for evaluation that requires path loadings from construct to measures to exceed 0.70. Internal consistency of reflective measures was checked with composite reliability measures (ρ) and average variance extracted (AVE), as suggested by Fornell and Larcker (1987). The discriminant

validity was examined by comparing the square root of the AVE for a particular construct to its correlations with the other constructs (Fornell & Larcker, 1987) and by examining cross-loadings of the constructs.

4 RESULTS

The group variance test confirmed two distinct groups. The first group consisted of the respondents from all male dominant VCs (VC1, 2, 3) while the other one, from female-dominant VC (VC4). All male dominant VCs were found invariant in both the measurement model and the structural model. Female-dominant VC was significantly different from the others in both measurement model and the structural model. Thus, the following data analyses were conducted separately for group 1 consisting of all male dominant VCs and group 2 consisting of the female dominant VC.

According to Harman's single-factor test (Podsakoff & Organ, 1986), common method variance is present if a single factor accounts for the majority of the covariance in the dependent and independent variables. No dominant factor emerging from the factor analysis was found, and the first factor only accounted for 11% of the variance, implying that common method variance was not a serious problem.

4.1 Measurement Model

The measurement validity and the reliability for reflective measures were examined with factor analysis and PLS analysis. Table 3 reports the descriptive statistics and the reliability for reflective measures. One concern with online surveys is the selection bias, that is, only highly identified members choose to participate. The data indicates that the rating of respondents' identification was around the mean with reasonable variance, implying that selection bias may not pose a threat to the validity. But group variance was observed.

	VC1			VC3		
	Mean	Std.	Cronbach's α	Mean	Std.	Cronbach's α
Identity Confirmation	5.16	1.52	0.87	4.7	1.79	0.77
Identification	4.1	1.76	0.88	3.7	1.69	0.83
Participation	5.04	1.53	0.83	4.61	1.7	0.81
	VC2			VC4		
	Mean	Std.	Cronbach's α	Mean	Std.	Cronbach's α
Identity Confirmation	4.46	2	0.79	5.38	1.39	0.89
Identification	2.3	1.53	0.87	4.3	1.64	0.90
Participation	4.4	1.77	0.90	4.85	1.65	0.87

Table 3. Descriptive Statistics and Reliability for Reflective Measures

Table 4 presents the loadings of the reflective measures to their respective constructs along with composite reliability scores, standard errors and t-statistics, resulting from the PLS analysis. All reflective items were significant at the 99% level with high loadings (all above 0.70 and most above 0.80), therefore demonstrating convergent validity. The composite reliability scores (ρ) of all latent constructs were higher than the recommended value of 0.80 (Nunnally, 1978), demonstrating internal consistency.

	Female dominant VC (N=162)		Male dominant VCs (N=193)	
	Loading	T-Test	Loading	T-Test
Participation	ρ=0.89; AVE =0.8		ρ=0.85 AVE =0.74	
Item1	0.92	38.2	0.85	24.7
Item2	0.87	16.9	0.85	11.1
Identification	ρ=0.91; AVE =0.64		ρ=0.94; AVE =0.72	

	Female dominant VC (N=162)		Male dominant VCs (N=193)	
	Loading	T-Test	Loading	T-Test
Item1	0.83	7.8	0.88	9.4
Item2	0.82	8.0	0.85	8
Item3	0.87	8.4	0.90	7.9
Item4	0.70	7.0	0.81	7.4
Item5	0.78	8.3	0.82	10.5
Item6	0.79	7.6	0.84	6.6
Identity Confirmation	ρ=0.8; AVE =0.52		ρ=0.84; AVE =0.64	
Item1	0.71	4.3	0.88	6.8
Item2	0.70	3.5	0.79	4.5
Item3	0.85	9.8	0.72	3

*** p<0.01; ** p<0.05; * p<0.1

Table 4. Measurement Model

Table 5 presents the discriminant validity statistics. The square roots of the AVE scores (diagonal elements of Table 8) were all higher than the correlations among the constructs, demonstrating discriminant validity. Furthermore, all items loaded higher on their respective constructs than on others, providing additional support for discriminant validity.

Note: (a) Female dominant VC: N=162; (b) Male dominant VCs: N=193	Identity Confirmation	Identification	Participation
Identity Confirmation	0.89(a); 0.8(b)		
Identification	0.15; 0.31	0.8; 0.85	
Participation	0.34; 0.27	0.35; 0.37	0.89; 0.86

Table 5. Discriminant Validity of Reflective Measures

4.2 Structural Model

Figure 1 presents the results of the PLS analysis of the structural model for two groups, including the overall explanatory power (R^2) and path coefficients (for relationships between latent variables). For both groups, the research model provided similar explanatory power: 21% of the variance of VC participation for female dominant VC and 25% for male dominant VCs. However, the relative importance of identification and identity confirmation was different between two groups. The group invariance test with identification, identity confirmation and VC participation (using the construct score) indicated such difference was significant.

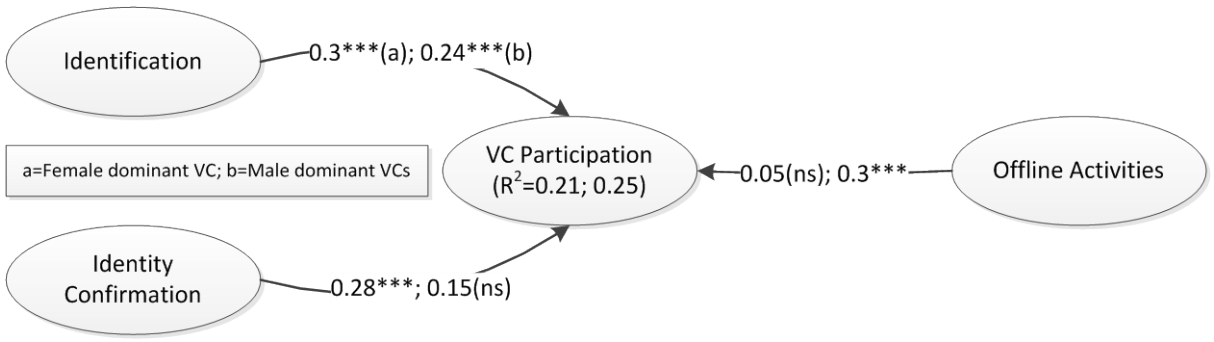

Figure 1. Structural Model

Consistent with prior research, the effect of identification on VC participation was found to be significant for both male and female dominant VCs (β=0.252; p<0.01 for Group 1; β=0.24; p<0.01 for

male dominant VCs), supporting H1. This suggests that the sense of belonging is a quite stable determinant for members to participate in VCs. The comparison of path coefficient between two groups did not reveal significant difference in the magnitude of the effect of identification on VC participation.

However, different from the prior study by Ma and Agarwal (2007), the effect of identity confirmation on VC participation was significant on in female dominant VC (β=0.28; $p<0.01$), but not in male dominant VCs. Thus, H2 was only supported with female dominant VCs. In female dominant VCs, members have stronger tendency for self-disclosure (Savicki & Kelley, 2000). Also, female same-sex disclosure was shown to be greater than male same-sex disclosure (Mulcahy, 1973). In addition, we found the participation of members in female dominant VCs was also significantly driven by identification (β=0.3; $p<0.01$). But in male dominant VCs, the tendency of self-disclosure is not encouraged and members' adoption of "Anarchic/Agonistic" norms (Herring, 1993) also limits the possibility for identity confirmation. The participation of members in male dominant VCs was found to be mainly by identification (β=0.24; $p<0.01$). Together with the comparison test for the path coefficient between identification and VC participation, the results provide partial support for H3.

Moreover, for female dominant VCs, both identity-based influences were found to operate independently as indicated by the insignificant correlation between identification and identity confirmation. This means members' identification with a VC could be most likely separated from to what extent that they get acknowledged by other members in the VC. For instance, one member, although rated high in identification, described how he/she felt about the VC:

> "When I said the forum (VC6) was too exclusive, I didn't mean membership is hard to obtain, but more that there is a certain clique of members who seem to interact with each other and it is hard to get into this clique and feel important/noticed."

In this case, even though this respondent failed to be accepted by the others, she still developed a strong identification with the VC.

To further validate the results regarding the moderating impact of gender composition as a VC characteristic, we examined the moderating effect of gender with all data from four VCs but did not find significant effect. This suggests that members tend to adopt norms by the majority gender in VCs.

5 IMPLICATIONS, LIMITATIONS AND FURTURE RESEARCH

Prior research has suggested two competing identity processes in explaining VC participation, i.e., identification and identity confirmation. In this research, we extend the existing research by exploring the moderating role of VC gender composition. Gender composition is one of major characteristics of VCs that affects the communication norms and community dynamics. By comparing VCs with different gender compositions, we empirically demonstrate how the effect of identification and identity confirmation on members' participation varies for gender compositions of VCs.

5.1 Implications

This study entails several important theoretical implications. First, while group composition has been mainly studied in the context of small task groups, this study extends the research to the context of VCs and examines the impact of gender composition on members' participation. This implies that, despite the bigger size and the lack of close interaction in VCs, members still can make sense of gender composition and associated norms, and adjust their communication strategies accordingly. Second, this research also extends existing research on VCs by accounting for important contextual factors such as gender composition. Existing typologies of VCs are either based on profile information (e.g., size, duration and etc.) or members' purposes (e.g., interests, relationship, or fantasies). But results of this study suggest that VCs also differ in terms of social interaction norms shaped by gender composition. Such differences, although difficult to be captured, perform as an important contingency

in understanding members' participation in VCs. Finally, this study advances research by accounting for diversity of identity-based mechanisms and demonstrating their relative importance in determining VC participation. Consistent with prior research, members in both male and female dominant VCs participate because of identification. But identity confirmation only matters for those in female dominant VCs. This result implies that members, by adopting group norms developed by the majority in communication, also have different expectations for VC participation. The different relative importance of identification and identity confirmation reflects how members make "identity sense" of VC participation based on gender composition.

Apart from the rich theoretical implications, this study also provides valuable suggestions to VC design and management. First, since the driving forces for VC participation may vary for different gender compositions, VC designers/administrators need to pay attention to the gender composition of active members and design policies accordingly. For instance, for male dominant groups, strict censorship may not be suitable. But features for communicating collective identities are important to help members develop identification with the VC. For female dominant groups, certain rules could be put in place to strength "Positive Politeness". Features for self-presentation and self-disclosure should be available to facilitate identity confirmation.

5.2 Limitations and Future Research

There are some limitations to this study that imply interesting and fruitful further research and are thus noteworthy. First, identification examined in this study focused on the identification with the VC. However, it is possible that members' identification was based on the perception of sub-groups, e.g., boards. Although the perceived VC identities and the measures for identification emphasized the overall VCs, it would be useful to incorporate the identification with sub-groups in future studies.

Second, the cross-sectional design of this dissertation implies that no causation can be determined. The significant paths between constructs can only be interpreted as correlation and the causal inferences are solely based on theoretical argumentation. Thus, future research is recommended to adopt a longitudinal approach to provide even more convincing evidence for the effects of identity processes on VC participation. Moreover, a longitudinal approach is also helpful in revealing how members make sense of group norms developed by the majority members.

Third, although the selection of real VCs that vary for topics, purposes, size and gender composition helps enhance the external validity, generalizations to other VCs still need to be made cautiously. The importance of identity processes may be highly context dependent. Therefore, more replications with different VCs are necessary. For instance, the future research can replicate the study with mixed-gender VCs.

Fourth, group composition may not be restricted to gender. There might be other characteristics that are salient and important in shaping communication norms and group dynamics. A contingency approach is necessary to incorporate community characteristics into VC research. Most VC research examines IT factors and/or individual factors while "community" is usually taken for granted. Prior research on identification reveals that group characteristics should be considered as important contingences influencing different routes to develop identification. For instance, Postmes et al. (2005) argue that the context where an intergroup dynamics is not obvious or given from the start will be more likely to induce the members to actively construct a norm or shared viewpoint. In another study, Postmes et al. (2005) demonstrate that the nature of group formation, i.e., common-bond vs. common-identity, also influences the formation of identification. However, research in this field is still in its infantry. Existing studies only provide limited and sparse evidence. More exploratory work is needed in this regard to understand the role of community characteristics.

Finally, this study explored two identity processes as mechanism underlying system design. Although the empirical data failed to show the interaction between identification and identity confirmation, it would still be worth exploring the transformation between these two identity processes. How or under

what conditions would identity confirmation strengthen/weaken members' identification with a VC? Such research will provide more insight into VC dynamics.

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